

ANDREA BEATTY RINKER  
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DEPARTMENT OF ECOLOGY

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Hand delivered to him on  
3/28/88  
BHL

March 28, 1988

Lin Robinson, Project Manager  
Seattle Engineering Department  
Solid Waste Utility  
Dexter Horton Building, Suite 750  
710 Second Avenue  
Seattle, Washington 98104

Dear Lin:

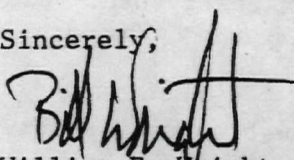
Attached are Ecology's comments on Seattle's following draft Midway Landfill remedial investigation reports:

- Summary Report,
- Summary Report: Section 4.0--Hydrogeologic Investigation, and
- Ground Water Technical Report.

Please call Mike Ruef at 438-3000 if you have any questions about the comments. Comments on the following draft reports will be submitted later:

- Ground Water and Leachate Well Monitoring Technical Memorandum,
- Hydrogeology Technical Memorandum, and
- Receptors Investigation and Preliminary Endangerment Assessment (hydrogeological aspects).

Sincerely,

  
William E. Wright, Project Manager  
Hazardous Waste Cleanup Program

cc: Pete Kmet  
Mike Ruef  
Ravi Krishnaiah  
Neil Thompson, EPA

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Superfund Branch

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M E M O R A N D U M

March 28, 1988

TO: Bill Wright  
FROM: Mike Ruef *L*  
SUBJECT: Midway Landfill Detailed Reviews of Hydrogeological Data Base

Remedial Investigation Summary Report

- p. 1-2 bottom para. Puget Sound is slightly more than a mile to the west.
- p. 5-7 Table 5.1 Why is chloride not included in their conventional surface water parameters? If it is suspected that ground water may contaminate surface water, which process is detected via chloride content, chloride should be analyzed for.
- p. 5-19 Table 5.9 Same chloride question especially when seep (surface) and probe (ground) waters are compared.
- 2nd para. Were all the seep-soil samples taken from the same depth below surface?
- p. 5-22 2nd para. The seeps in the slag-ballasted parking lot below (west of) the Les Schwab Tire shop off Hwy. 99 are strongly colored brown and green with precipitation observable. Did they sample the same spots I saw about a year ago? Why are no unusual constituents found in the water?
- p. 5-25 1st para. Same concern about the Les Schwab seeps, as above.

Remedial Investigation Summary Report: Section 4.0  
Hydrogeologic Investigation

- p. iii     Figure 4-2. Should read: Generalized Hydrogeologic Section not Hydrogeologic Cross Section.
- p. 4       3rd para. Hydrostratigraphic Unit Landfill Aquifer should be plural because in my opinion the landfill contains several aquifers, some of them perched, some of them more continuous.
- p. 6       top para. The mentioned AGI report should be quoted here by exact title. (Hydrogeology Tech. Memo. p. 67 Fig. 33).
- p. 7       bottom para. The landfill is a heterogeneous man made artifact and most likely contains several discontinuous water transmitting/conducting layers. That sequence should thus be called "landfill aquifers." I assume also that it is synonymous with "landfill waste" and "leachate aquifers" which terms are used repeatedly in the reports.
- p. 9       para 4.2.3. How can "ground water flow vertically toward a ground water divide" that is located to the side and would still direct flow laterally toward east and west?
- p. 10      Table 4-1. Unit Landfill Waste. This unit should be called Landfill Aquifer.
- 1st para. They should explain that the vertical migration they are mentioning means that leachate (or contaminants) with the ground water moves down below the landfill around MW-19 and even deeper around MW-14 before laterally migrating off-site toward the SE.
- p. 11      Figure 4-3. Identify here and later on as well as in other reports (or highlight) those wells or other data points which were specifically used to construct the respective illustration.
- p. 17      Table 4-4 In Secondary Drinking Water Standards; % Exceedance column, two figures are wrong: for iron the value is 64,700% and for manganese it is 1640%.
- 1st para. Why are dissolved metals in unfiltered samples not mobile? Is it because they oxidize, precipitate, flocculate or adsorb to suspended soil particles? Otherwise, dissolved constituents whether metals, organics or other are certainly mobile.

bottom para. "Four of these compounds found ..." not three.

p. 18 2nd para. Ground water discharge into Midway is mentioned especially from the east. What evidence other than one old photo from the aggregate mining days does AGI have for that statement? Also, most likely that (infiltration into the old pit) situation is substantially different today because of the large black topped surface area and residential build up in the Linda Heights neighborhood. AGI also mentions that, although small in volume, ground water discharge is "potentially a major pathway for contaminants to enter the landfill." How come? Where would that contamination come from?

p. 19 3rd para. "...short residence time..." Does that imply that the analyzed ground water portion has only arrived too recently to have reacted with its host rocks already or that it flows too fast to allow reaction time at all?

Four distinct hydrogeochemical facies... Is leachate more bicarbonate than chloride dominant?

p. 21 Fig. 4-6. The Ca-curve at leachate well 2 should start at 100%, not 0%. Also, what is the reason that the Ca-content of leachate increases 2.5 times within a 75 foot distance from the landfill?

p. 24 4th para. Clarify the first two sentences, specifically the "divalent-trivalent cation competition." I do not understand this explanation for elevated ion concentrations. Also what "other waste disposal practices" are meant?

p. 27 Table 4-6. Chloride values for wells MW19 A and B also exceed secondary Drinking Water Standards.

p. 28 third para. Fourteen seeps are mentioned. Groups of 5 and 3 are identified as belonging to different aquifers, yet each of those groups lists SP-G. Does seep G discharge ground water from the upper gravel aquitard or the lower gravel aquifers? These two zones are almost 90 vertical feet apart. Also, the "lower gravel aquifers" are presumably the northern and southern gravel aquifers. The some discrepancy also applies to seep H.

p. 31 3rd para. How can they explain that parent compounds of some HSL organics were found in greater concentrations in ground water off-site than in leachate on-site? "Other sources" is a weak and inconclusive argument.

4th para. How can they explain then that organics present in leachate "do not migrate because they tend to be bound by detrital soil particles." This does not agree with my knowledge of landfills where the organic phase or phases often move off-site ahead of the inorganic because the latter is really the

one more likely retained in the landfill or nearby soils due to adsorption. In addition, the term "detrital organic soil" is a contradiction in itself. Detrital sediments are notoriously void of "organics," unless they were deposited in the form of bogs and the like. And it probably makes any soil scientist cry for mercy to have someone call landfill wastes "soil."

p. 41 bottom para. Again, the explanation is missing why four other organic compounds occur in higher concentrations in ground water off-site than in leachate on-site.

p. 42 2nd para. The last sentence needs explanation.

3rd para. This statement reflects in my opinion "wishful thinking." On most of the respective maps there are just not enough data per aquifer to plot a trend from the spot like isolated appearance(s) of a compound at one or the other location.

bottom para. I thought that "sorption" is a retardation process for constituents in ground water which mainly applies to inorganics. I am not aware that organic compounds, especially the dissolved fraction, control their migration rates away from a landfill by sorption to soil particles. Chlorinated organics are nonpolar and do not adhere to soil particles.

p. 45 2nd para. Is the 40% organic content in Midway a realistic value?

p. 46 1st para. This statement is not supported by observations in many landfills which show that many organics move ahead of the inorganic phase in their off-site migration.

bottom para. Off-site sources should be replaced with off-site areas.

p. 48 2nd para. The explanation of the term "residual saturation value" appears awkward. Does it mean that amount of moisture which remains in the soil without an applied head or fluid pressure?

Last sentence. The possibility referred to needs more explanation.

4th para. The explanation for the presence of high amounts of acetone in MW-16 from an off-site source and based on one spike in one sample is weak.

p. 49 2nd para. To accept this paragraph requires two assumptions on my part.

(a) Chloride has to behave chemically and physically in its off-site migration such that it is representative of plume

extent and contaminant distribution, i.e., in concert with the bulk of the organic and inorganic phases.

- (b) The linear velocities calculated for the northern and southern gravel aquifers especially but for the higher aquifers as well have to be used most conservatively and at values which are less than 1 ft./day to match the calculated off-site travel distance of 2,500 lineal feet to date.
- (c) To buy the statement that "some off-site migration of leachate has occurred" is not convincing considering the amount of organic goop that was excavated during the on-site gas extraction well drilling phase and the large volumes of combustible gases which are still produced by the landfill. Otherwise, I have to assume that waste-breakdown in the landfill goes by processes I am not familiar with.

Remedial Investigation Ground Water Technical Report

- p. 14 top para. "The shallowness of the wells also precluded characterization of the uppermost aquifer." This aquifer would be part of the "Perched Aquifers" and should be identified by that name, to be consistent.
- p. 15 Table 1 - Background Water Quality. The average of 1.2 mg/l for Fe cannot be greater than the high of the range 0.8 - 1.1.
- p. 20 Table 2 - Ground Water Monitor Well Installation Data. MW-25 has three well completions, not 2. Under Notes: 3. Verify the dedicated pump model numbers and depths, i.e., which model # pump has which piston diameter and is set at what depth?
- p. 39 1st and 2nd para. How can one observe "pebbles moving at moderate to high speed" across the bottom of a borehole with a diameter of 12 inches or less and some 30 feet deep? Which aquifer was "confined?" The Uppermost Aquifer or the Upper Gravel Aquifer? If it was confined, how could ground water flow fast enough to move gravel.
- p. 45 bottom para, last sentence. Can they substantiate this statement that the ground water source for flow in the Upper Gravel Aquifer in the vicinity of Parkside Wetland is to the north of the landfill?
- p. 48 Missing.
- p. 51 2nd para. Does AGI have suggestions on whether and how to extend the existing monitoring well network to the SE? If this "sink" exists, which is quite possible, where do ground water and contamination go from there on? And what are potential receptors, i.e. what are the receiving surface water bodies?
- p. 54 Figure 5-8. The way they have their so called ground water divide layed out does not make sense to me. I also question the presentation of the isopotential lines.
- p. 55 2nd para. Does Parametrix have enough data to determine (as will be necessary for the FS) which contaminants would arrive at the discharge area(s) or location(s), when and possibly at what concentrations?
- p. 56-60 Table 5. The analytical values for chloride in all wells during sampling round 4 (the only synoptic round) do not seem to support the assurance that chloride makes such an ideal tracer as it is stated throughout all reports.
- p. 69 Table 10. Volatile Organic Compounds. Acetone was reported detected in high enough values in off-site well MW-16 south of



Midway to attribute its occurrence to an off-site source. (Hydrogeologic Investigation p. 48). The above table does not even list MW-16 for acetone. Why is this discrepancy?

p. 75 2nd para, last 3 sentences. These statements do not sound convincing. Substantiate how assumed ground water run on from the north into the landfill can be considered "a major pathway for contaminated ground water to enter the landfill." And which contaminants would then be added to leachate?

p. 78 Table 14. The percentage exceedance figures for iron and manganese appear to be way too low. They should be rechecked.

p. 80 top para. Is there a difference between a Piper and Trilinear Diagram? If so explain, otherwise use only one term (In Hydrogeological Tech. Memo, page 93 (Figure 49)) they use the term Trilenear Diagram.

p. 83 top para, first sentence. Do they imply that the chloride concentrations in ground water of 1-100 mg/l are background? i.e., a natural situation around Midway? Or as a result of contamination from leachate?

p. 84 or p. 94 either one or the other page is missing completely.

p. 98 Table 15 - Chloride Values. Chloride is considered an important tracer element for leachate. Why have then not all the wells during the only synoptic and complete sampling round #4 been sampled and analyzed for that constituent? Or, if they were, why are respective figures not shown here (i.e., wells MW-8, 9, 11, 12, 13 16, 25, 27, 28)?

p. 99 top para. Which "other waste disposal practices" are meant? Specific tanks?

p. 101 top para. Same comment as on p. 28 of the Summary Report. (Hydrogeologic Investigations).

p. 103 3rd para. The statement that "...percent compounds are found in greater concentrations off-site than in leachate." is hard to believe as a matter of principle, also at Midway. This needs explanation. Or does Parametrix construe this phenomenon as a basis for off-site sources, from where daughter contaminant compounds move to the landfill?

4th para. Same comment as on p. 31 Summary Report - Hydrogeologic Investigations.

p. 105 top para. Same question and comments as on p. 103.



p. 106 top para. The "pattern" referred to in this paragraph may be obvious to Parametrix but not to me. It appears they use the act of "coupling" aquifers for chemical identification and interpretation which I think is questionable. They also have more explaining to do on the ethane-ethene patterns they are attempting to point out in the Figure sequence 6-13-6-17 and which certainly do not speak for themselves or are not self explanatory. In that sequence, two concentration numbers above (Fig 6-13) do not form a discernible pattern; it does not appear realistic to me that NW-10 and 17 could be considered off-site source areas for an ethane-ethene breakdown sequence in ground water traceable west to east underneath the whole landfill which bleeds off thousands of gallons of leachate composed of all kinds of exotic stuff into the underlying aquifer sequence. Neither the partitioning process nor the dehalogenation data help to systematically match observed contaminant concentrations or parent to end reduction sequences with gradient derived ground water flow patterns.

In Figure 6-15 how can one show a concentration or a gradient away from the landfill toward east and west with only one value (80.0 in MW-14) in the center of the "source area?" In Figure 6-16 (p. 110) where is the parent (source) area for this sequence? In Figure 6-17 do they mean, that the parent (source) area (P) is around MW-1, from there the secondary products (I, E) move south to MW-15 (HI, I, E) then northwest (upgradient toward MW-17)? This scheme does not work.

p. 112 2nd para. To what material does their assumed bulk mass density of 8.22 apply? And what do they mean by bulk mass density in contrast to bulk density?

p. 113 Table 17 (migration rates, etc.) As I said earlier, these migration rates have to be taken very conservatively or retardation rates (Table 18) for volatile organic constituents are actually higher than calculated in order to come up with a maximum plume expansion distance of only 2,500 feet over a time period of almost 20 years.

p. 116 2nd para (and p. 120 1st para.). The "observation" was made that "organics present in the leachate are strongly retained by (or firmly bound to) the landfill." The same comments apply as on p. 31 - Summary Report (Hydrogeologic Investigations). Again, what facts exist to make that observation? Is the implication, that the landfill as a whole acts like an organic carbon filter which retains (not retards) organic liquids? I cannot interpret the referenced table 10 (p. 69-71) that way.

p. 116 bottom para. "...off-site contamination source in area of wells MW-28, -27, -21, -17, -10 demonstrated through the chloride plume." This conclusion needs more explanation.

p. 117 bottom para. What evidence exists for the "seasonal perched aquifers...discharging into Midway Landfill" and how substantial is that discharge?

p. 118 1st para. "Residual saturation" needs further description.

last para. Acetone spike in MW-16. The statement that "...subsequent samples were not available for comparison. . ." seems not correct. The 17,000 ppb was a one time peak from sampling round #3. During rounds #4 and #5 values dropped to 10 ppb and trace, respectively. Thus subsequent samples were available. Also, in my opinion a one time peak should not be construed as evidence for an off-site source. MW-16 is a deep well (166 feet) and depth to water is around 120 feet. It is more likely an artifact of sampling methods or well drilling/installation.

MR:ra